

SILICON POWER TRANSISTOR
NEL2035F03-24

NPN SILICON EPITAXIAL TRANSISTOR
L Band Power Amplifier

DESCRIPTION AND APPLICATIONS

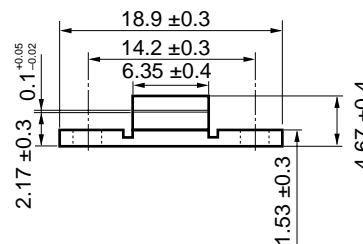
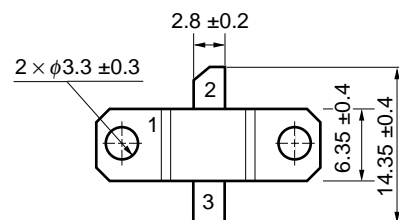
NEL2035F03-24 of NPN epitaxial microwave power transistors is designed for 1.8-2 GHz PHS/PCN/PCS base station applications.

It incorporates emitter ballast resistors, gold metallizations and offers a high degree of reliability.

FEATURES

- High Linear Power and Gain
- Low Internal Modulation Distortion
- High Reliability Gold Metallization
- Emitter Ballasting
- 24 V Operation

OUTLINE DIMENSIONS (Unit: mm)



1 - EMITTER
2 - BASE
3 - COLLECTOR

ABSOLUTE MAXIMUM RATING (T_A = 25 °C)

PARAMETER	SYMBOL	SPECIFIED CONDITION	RATINGS	UNIT
Collector to Base Voltage	V _{CB0}		45	V
Collector to Emitter Voltage	V _{CER}	R = 10 Ω	30	V
Emitter to Base Voltage	V _{EBO}		3	V
Collector to Emitter Voltage	V _{CEO}		18	V
Collector Current	I _c		14	A
Power Dissipation	P _T		79.5	W
Thermal Resistance	R _{th(j-c)}		2.2	°C/W
Junction Temperature	T _j		200	°C
Storage Temperature	T _{stg}		-65 to 150	°C

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

PARAMETER	SYMBOL	SPECIFIED CONDITION	MIN.	TYP.	MAX.	UNIT
Collector to Emitter Cutoff Current	I _{CES}	V _{CE} = 24 V			10	mA
Collector to Emitter Voltage (Base to Emitter Resistor = 10 Ω)	V _{CER}	I _C = 20 mA, R = 10 Ω	30	85		V
Collector to Emitter Voltage (Open Base)	V _{CEO}	I _C = 20 mA	18	22		V
Collector to Base Voltage (Open Emitter)	V _{CBO}	I _C = 20 mA	45	85		V
Emitter to Base Voltage (Open Collector)	V _{EBO}	I _C = 25 mA	3	5.3		V
DC Forward Current Gain	h _{FE}	V _{CE} = 5 V, I _C = 1 A	30	100	150	
Output Capacitance	C _{ob}	V _{CE} = 24 V, f = 1 MHz		189		pF

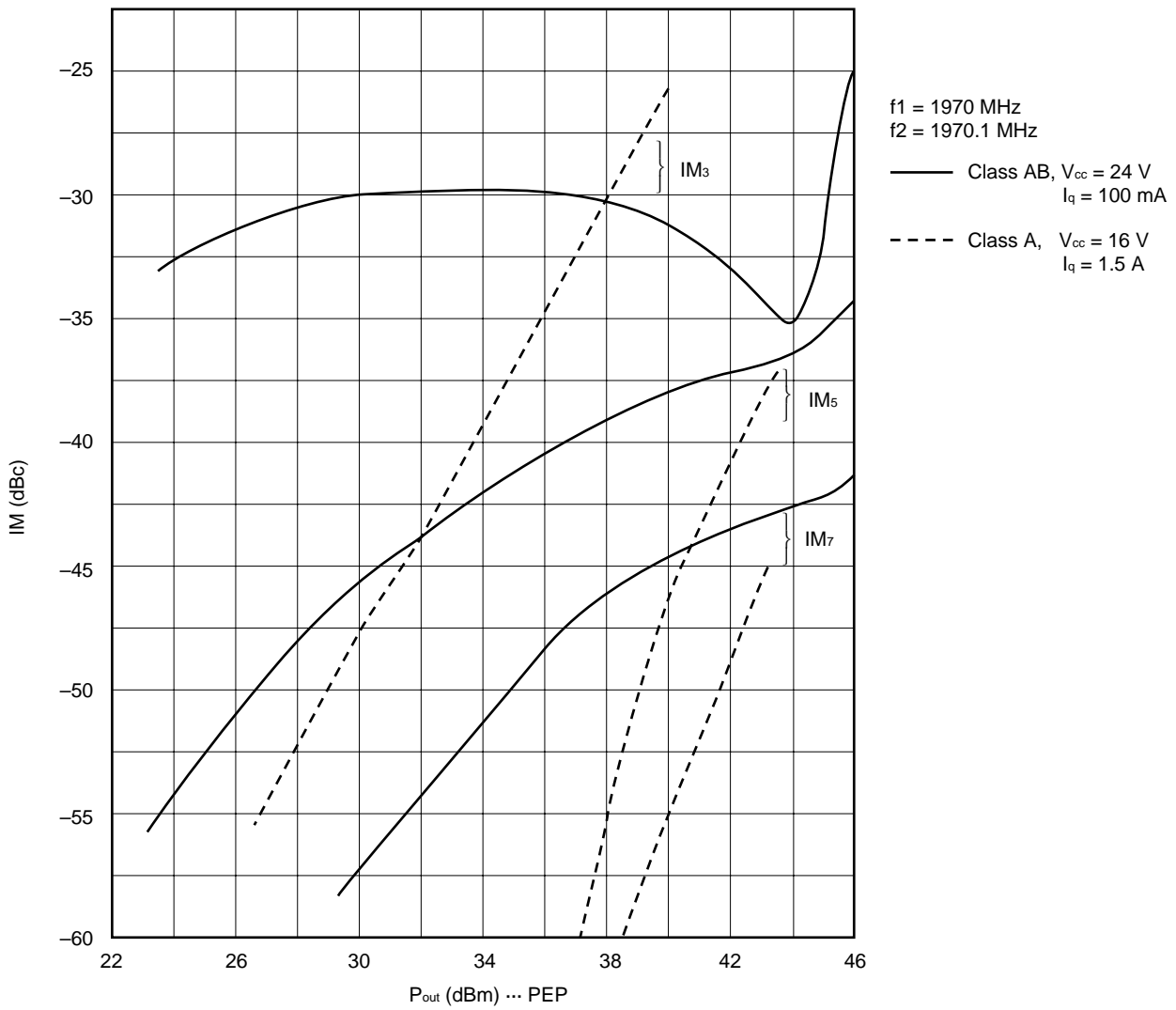
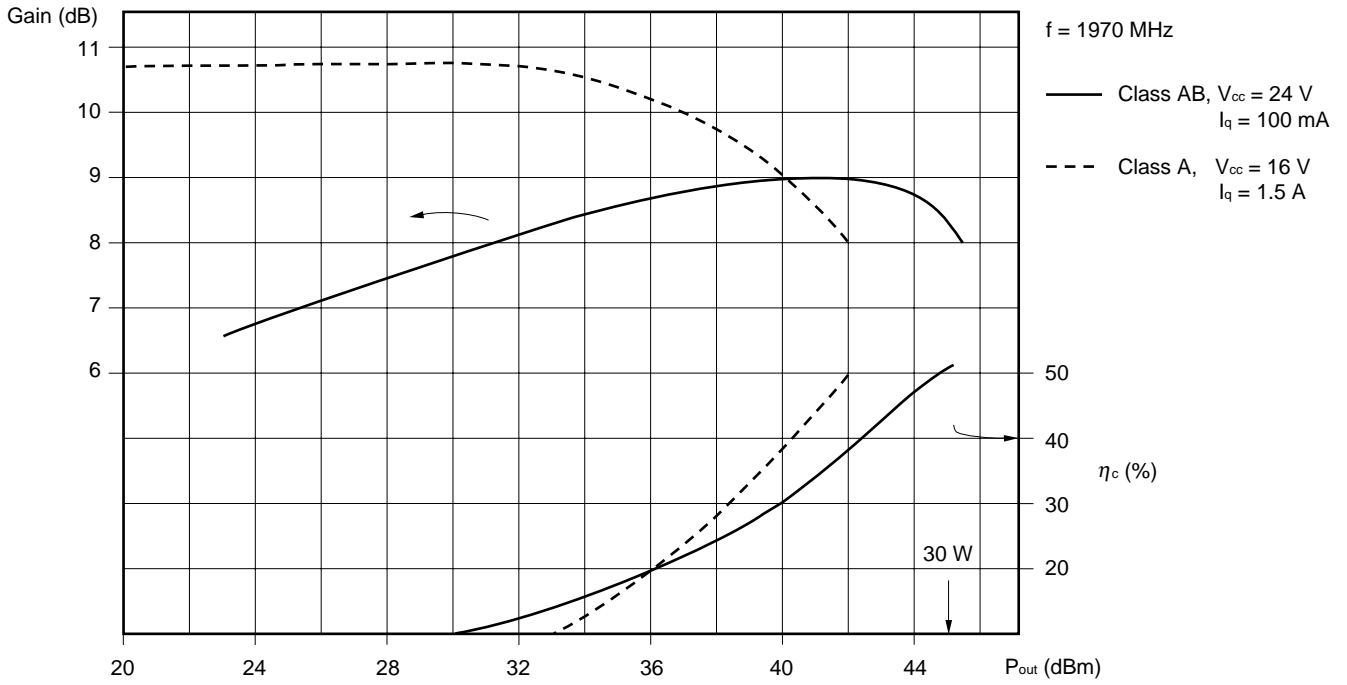
PERFORMANCE SPECIFICATIONS (T_A = 25 °C)

CLASS AB OPERATION

PARAMETER	SYMBOL	SPECIFIED CONDITION	MIN.	TYP.	MAX.	UNIT
Output Power	P _{ldB}	f = 1.97 GHz, I _q = 100 mA, V _{CC} = 24 V, CLASS AB	30	33		W
Collector Efficiency	η _C	f = 1.97 GHz, P _{out} = P _{ldB} , I _q = 100 mA, V _{CC} = 24 V, CLASS AB	40	50		%
Linear Gain	GL	f = 1.97 GHz, P _{in} = 2 W, I _q = 100 mA, V _{CC} = 24 V, CLASS AB		9		dB
3rd Order Intermodulation	IM ₃	f = 1.97 GHz, Δf = 100 kHz, 30 W PEP, V _{CC} = 24 V, I _q = 100 mA, CLASS AB		-33		dBc

CLASS A OPERATION

PARAMETER	SYMBOL	SPECIFIED CONDITION	MIN.	TYP.	MAX.	UNIT
Output Power	P _{ldB}	f = 1.97 GHz, I _q = 1.5 A, V _{CC} = 16 V, CLASS A		7		W
Collector Efficiency	η _C	f = 1.97 GHz, P _{out} = P _{ldB} , I _q = 1.5 A, V _{CC} = 16 V, CLASS A		30		%
Linear Gain	GL	f = 1.97 GHz, P _{in} = 0.1 W, I _q = 1.5 A, V _{CC} = 16 V, CLASS A		10.7		dB
3rd Order Intermodulation	IM ₃	f = 1.97 GHz, Δf = 100 kHz, 5 W PEP, V _{CC} = 16 V, I _q = 1.5 A, CLASS A		-33		dBc



S-PARAMETER

NEL2035 Class A

V_{CC} = 16 V, I_{cq} = 1.5 A

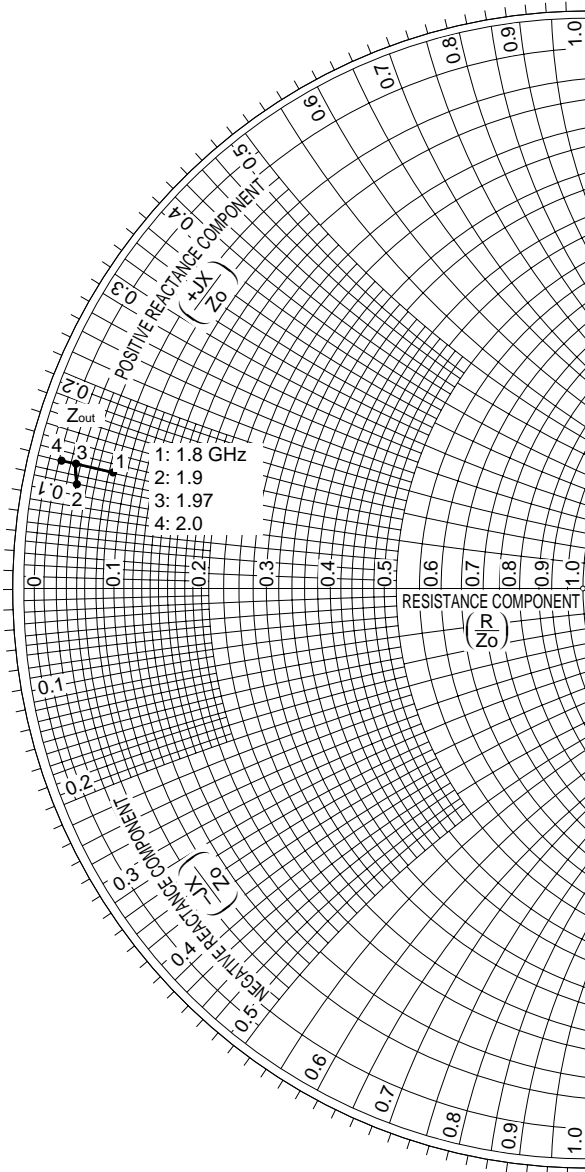
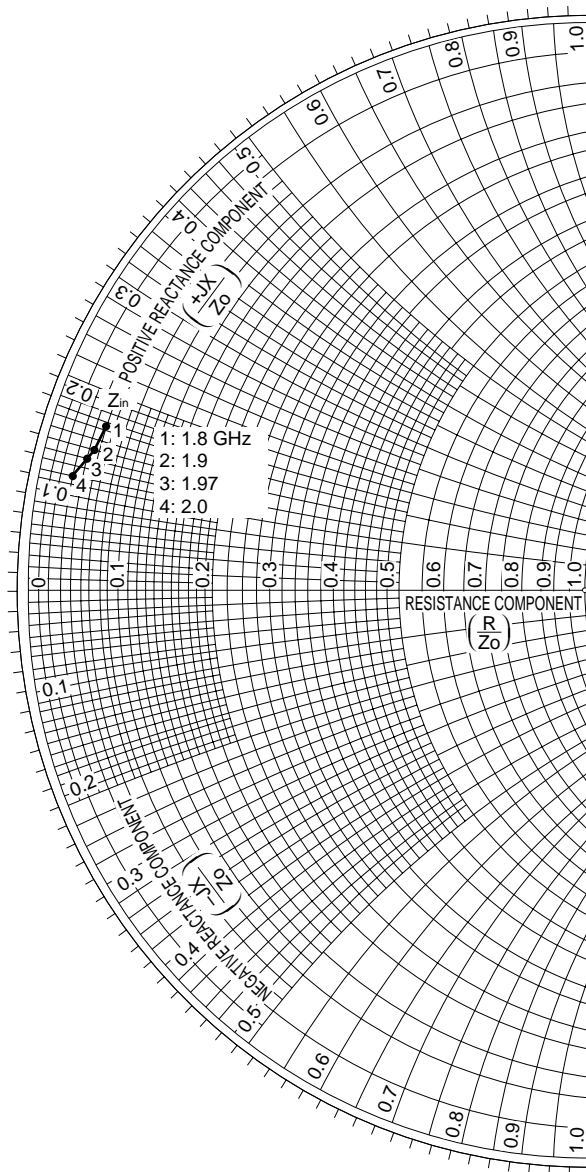
FREQUENCY GHz	S ₁₁		S ₁₂		S ₂₁		S ₂₂	
	MAG	ANG (DEG)	MAG	ANG (DEG)	MAG	ANG (DEG)	MAG	ANG (DEG)
1.70	0.98	165	0.04	48	0.42	73	0.92	160
1.71	0.98	165	0.04	47	0.44	71	0.91	160
1.72	0.98	165	0.04	47	0.47	68	0.90	160
1.73	0.97	164	0.04	45	0.49	65	0.89	160
1.74	0.97	164	0.04	43	0.51	62	0.88	160
1.75	0.96	164	0.04	40	0.54	59	0.87	160
1.76	0.95	163	0.04	37	0.57	57	0.86	160
1.77	0.94	163	0.04	33	0.61	53	0.85	160
1.78	0.93	163	0.04	29	0.65	48	0.84	161
1.79	0.92	162	0.04	25	0.69	43	0.82	161
1.80	0.90	162	0.04	21	0.71	37	0.81	162
1.81	0.89	162	0.05	15	0.74	32	0.80	163
1.82	0.87	163	0.05	10	0.78	26	0.79	165
1.83	0.86	163	0.05	-1	0.81	19	0.79	166
1.84	0.85	164	0.04	-8	0.83	11	0.79	168
1.85	0.84	165	0.04	-14	0.84	3	0.80	170
1.86	0.83	167	0.04	-15	0.81	-5	0.82	171
1.87	0.84	168	0.03	-20	0.78	-11	0.84	172
1.88	0.84	169	0.03	-25	0.75	-18	0.87	172
1.89	0.85	170	0.03	-28	0.72	-24	0.89	172
1.90	0.86	171	0.02	-33	0.69	-30	0.91	172
1.91	0.87	171	0.02	-36	0.65	-36	0.93	172
1.92	0.89	171	0.01	-38	0.60	-42	0.94	171
1.93	0.90	171	0.01	-34	0.55	-46	0.95	171
1.94	0.90	171	0.01	-26	0.51	-49	0.96	170
1.95	0.91	171	0.01	-21	0.49	-51	0.97	169
1.96	0.92	171	0.01	-13	0.46	-55	0.97	169
1.97	0.93	171	0.01	-1	0.43	-58	0.98	168
1.98	0.93	171	0.01	16	0.40	-61	0.98	168
1.99	0.94	171	0.01	30	0.37	-63	0.98	167
2.00	0.94	171	0.01	38	0.35	-65	0.99	167

NEL2035 Class AB

V_{CC} = 24 V, I_{cq} = 0.1 A

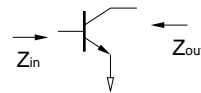
FREQUENCY GHz	S ₁₁		S ₁₂		S ₂₁		S ₂₂	
	MAG	ANG (DEG)	MAG	ANG (DEG)	MAG	ANG (DEG)	MAG	ANG (DEG)
1.70	0.98	167	0.04	68	0.20	90	0.95	156
1.71	0.98	167	0.04	65	0.22	88	0.95	155
1.72	0.98	167	0.04	63	0.23	86	0.94	155
1.73	0.98	166	0.04	61	0.25	84	0.93	154
1.74	0.98	166	0.04	60	0.26	82	0.92	154
1.75	0.97	166	0.05	59	0.28	80	0.92	153
1.76	0.97	166	0.05	56	0.30	79	0.90	152
1.77	0.97	165	0.05	53	0.33	76	0.89	151
1.78	0.97	165	0.05	51	0.36	72	0.87	150
1.79	0.96	165	0.06	48	0.38	68	0.85	149
1.80	0.96	164	0.06	45	0.42	65	0.82	147
1.81	0.95	164	0.07	41	0.45	60	0.78	146
1.82	0.94	164	0.07	35	0.51	55	0.74	145
1.83	0.93	164	0.08	31	0.56	49	0.68	144
1.84	0.92	163	0.08	23	0.62	41	0.62	145
1.85	0.90	163	0.08	15	0.67	32	0.55	148
1.86	0.88	164	0.08	4	0.71	21	0.49	155
1.87	0.87	165	0.08	-7	0.73	10	0.47	165
1.88	0.86	166	0.08	-18	0.74	-1	0.49	56
1.89	0.86	167	0.07	-29	0.72	-13	0.56	-56
1.90	0.87	169	0.06	-39	0.68	-23	0.64	-173
1.91	0.88	169	0.05	-48	0.63	-33	0.72	-173
1.92	0.89	170	0.05	-56	0.57	-42	0.78	-174
1.93	0.90	170	0.04	-62	0.51	-49	0.83	-176
1.94	0.91	170	0.03	-67	0.46	-54	0.86	-58
1.95	0.92	170	0.03	-71	0.42	-58	0.89	60
1.96	0.93	170	0.02	-74	0.39	-63	0.91	178
1.97	0.93	170	0.02	-77	0.35	-67	0.92	177
1.98	0.94	170	0.02	-80	0.32	-70	0.93	175
1.99	0.94	169	0.01	-84	0.30	-73	0.94	174
2.00	0.95	169	0.01	-89	0.27	-76	0.95	173

NEL2035F03-24 Z_{in}/Z_{out}

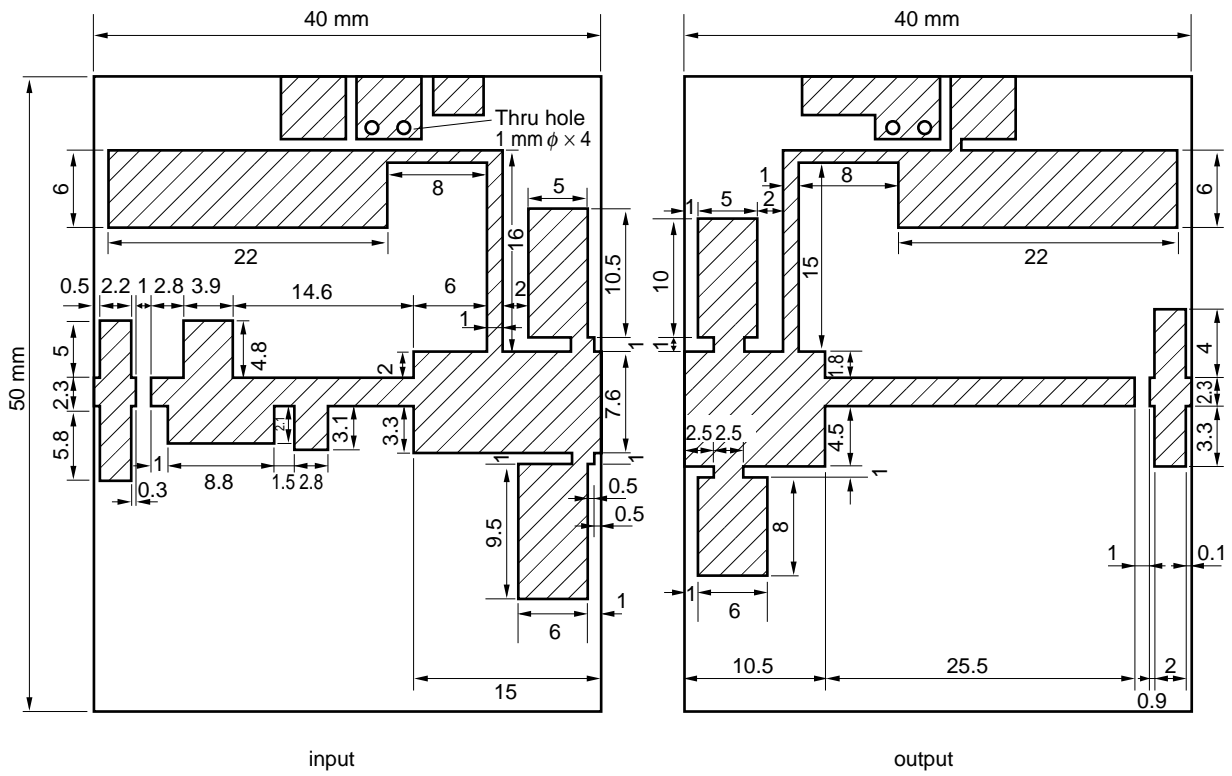


$Z_o = 50 \text{ ohm}$

f [GHz]	Z_{in} [ohm]	Z_{out} [ohm]
1.80	$2.6 + j8.4$	$4.6 + j5.8$
1.90	$2.3 + j7.0$	$2.0 + j5.2$
1.97	$2.3 + j6.5$	$2.3 + j6.0$
2.00	$1.6 + j5.6$	$1.3 + j6.2$



Circuit Drawing

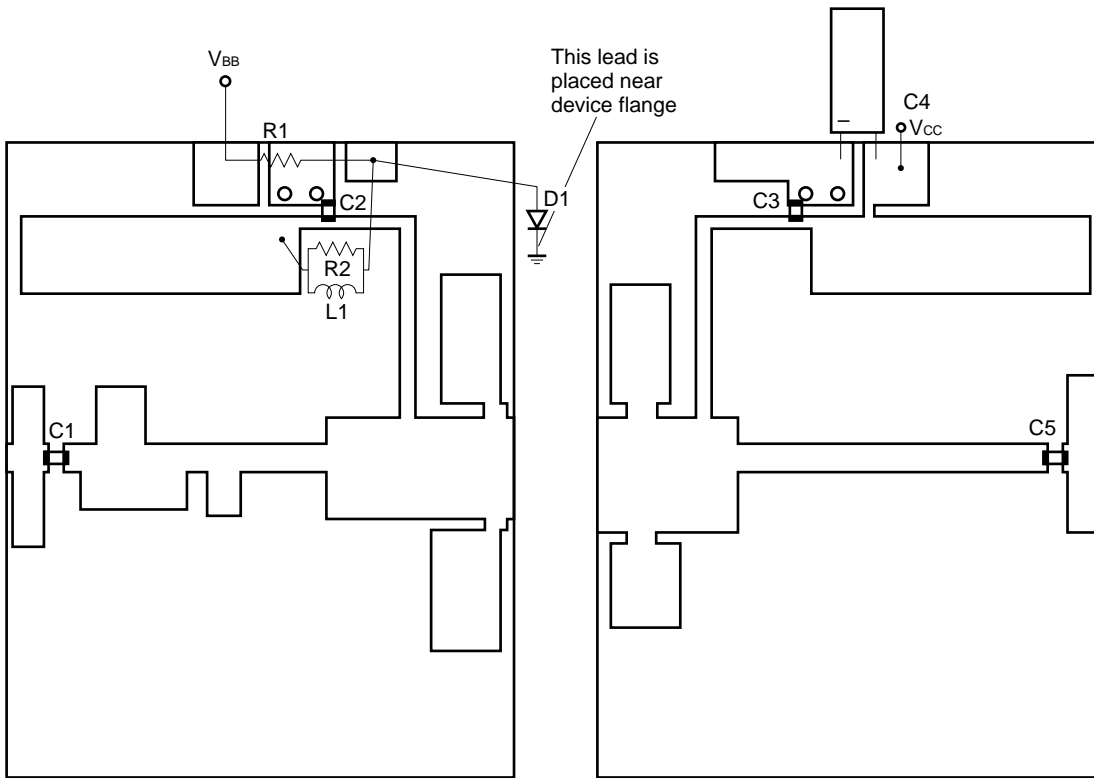


SUBSTRATE (TEFLON)

DICLAD522T®

THICKNESS = 0.79 mm
DOUBLE SIDE 35 μm Cu
 $\epsilon_r = 2.60$

Components Layout



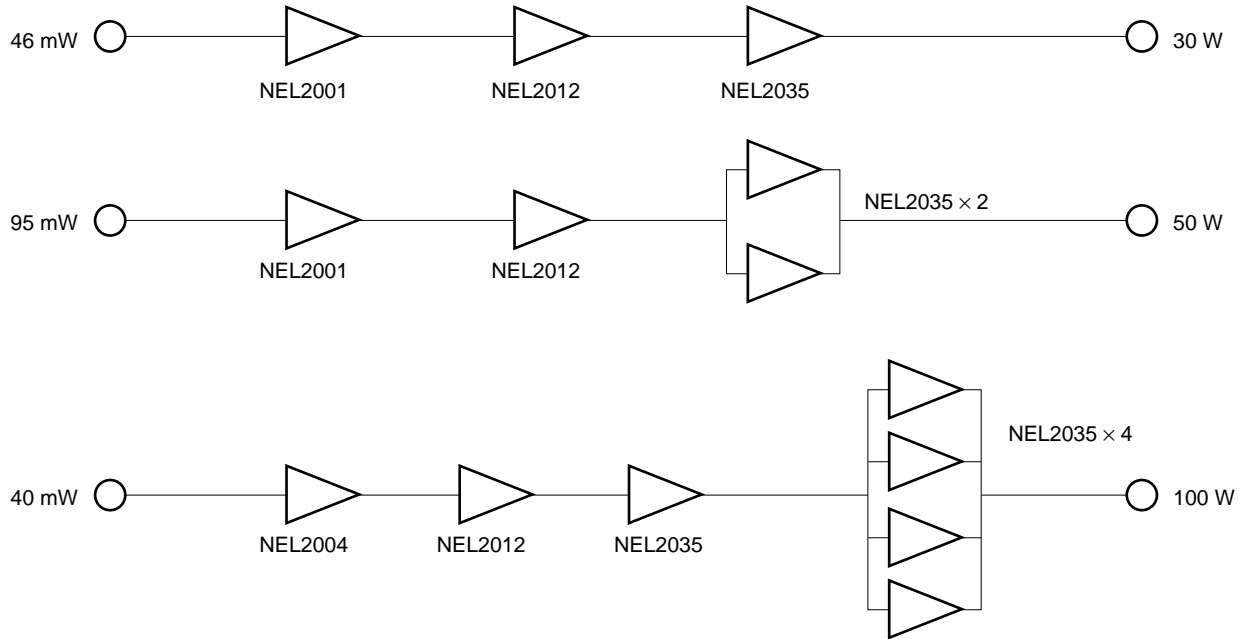
input

output

- R1: 5.1 Ω
- R2: 30 Ω
- L1: 5 mm ϕ 10T
- C1, C2, C3, C5: MURATA 47 pF
- C4: 22 μ F (50 V)
Electrolytic Capacitor
- D1: V06C

APPLICATION

= Amplifier Diagrams =



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